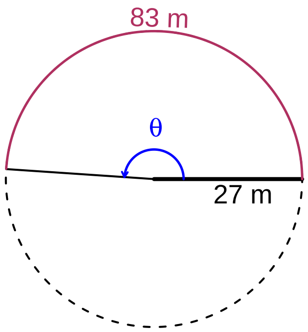
Name: Date:

Trig Final (SLTN v663)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 83 meters. The radius is 27 meters. What is the angle measure in radians?

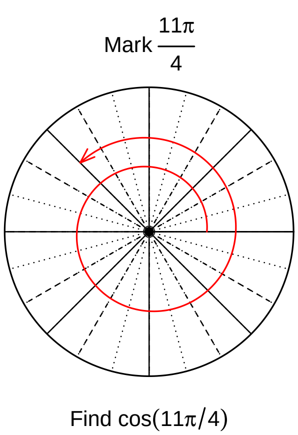


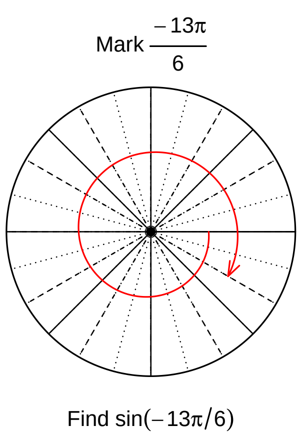
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 3.074$ radians.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).





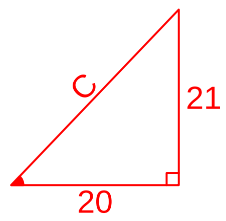
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-13\pi/6) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{21}{20}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

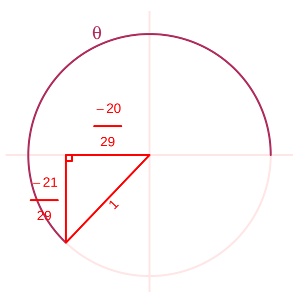
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + 21^2 = C^2$$
$$C = \sqrt{20^2 + 21^2}$$
$$C = 29$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.64$ meters, an amplitude of 6.42 meters, and a frequency of 4.89 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.42\sin(2\pi 4.89t) - 2.64$$

or

$$y = -6.42\sin(9.78\pi t) - 2.64$$

or

$$y = -6.42\sin(30.72t) - 2.64$$